Constants of Explosion of Cordite and of Modified Cordite.

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(Abstract.)

Objects of the Investigation.—These were to determine, under the conditions of pressure obtaining in a gun, the constants of explosion of cordite and of modified cordite, with special reference to the effects produced by the non-explosive ingredients, mineral jelly and acetone. The large increase in the percentage of guncotton which characterises modified cordite causes the retention of a greater quantity of volatile matter than was found in the older cordite; the nature of this volatile matter and its effects on the constants of explosion are examined.

Apparatus and Procedure.—The bomb, made to the design of Colonel Holden, F.R.S., at the Royal Gun Factory, had a chamber capacity of 128·32 c.c., was made of gun steel of about 3·3 cm. in thickness, and was fitted with arrangements for obturation and electrical insulation of the firing-pin and for drawing off the gases, which worked well in practice (diagram accompanies paper). The calorimeter and method of ascertaining the water equivalent of the apparatus are described (diagram), as are also the procedure when a shot is fired (diagram) and the means adopted for collecting and measuring the gases evolved (diagram).

Results. The results are embodied in a number of tables and include analyses of the explosive and of the volatile matter contained in it, the calories per gramme (water liquid and water gaseous), analyses of the gases evolved, the theoretical temperature of explosion (on the basis of the alteration of specific heat of the gases according to the data of Mallard and Le Chatelier), the theoretical pressure and the heat of formation of the explosives from the elements at constant pressure.

Calculations of the heat developed by the explosive are made from the heats of formation of the constituents of the explosive and products of its decomposition, and it is shown that the results so obtained are in good agreement with the actual calorimetric results. For the purpose of this calculation a special determination of the constants of Waltham Abbey guncotton was made.

Consequent on the change in composition from cordite to modified cordite,

the following are among the differences brought out, namely, a decrease in heat of 200 calories, and in temperature of explosion of 300° C.—facts which have a bearing on the decreased erosion found with the latter explosive—an increase in volume of gas and changes in the character of the gases.

The effect of the presence of mineral jelly in both natures of cordite is examined, as to the great diminution of heat, increase in volume of gases, etc., that result.

In a similar way the effect of the varying quantities of volatile matter found in modified cordite is investigated as to the constants of explosion. It is shown that in the modified cordite actually made the water in the volatile matter is practically constant, variations being due to acetone retained. Decrease in heat evolved, increase in gases and differences in composition of these gases due to the presence of acetone, are some of the results brought out in this part of the work.

Note is also made of the alterations in the constants of explosion due to increasing the density loading from 0·1 to 0·2.